

Figure 1

Index represent ation	Cutting Speed Fuzzy Model				Feed Rate Fuzzy Model			
	1 st input (material hardness)		2 nd input (depth of cut)		Input (depth of cut)		Output (feed rate)	
	Abbreviation	Expression	Abbreviation	Expression	Abbreviation	Expression	Abbreviation	Expression
0	VS	Very Soft	VS	Very Shallow	VS	Very Shallow	VS	Very Slow
1	S	Soft	S	Shallow	S	Shallow	S	Slow
2	MD	Medium	MD	Medium	MD	Medium	MD	Medium
3	H	Hard	H	Deep	H	Deep	F	Fast
4	VH	Very Hard	VH	Very Deep	VH	Very Deep	VF	Very Fast

Figure 2

Index representation	Abbreviation	Expression
0	EVS	Extremely very slow
1	ES	Extremely slow
2	VVS	Very very slow
3	VS	Very slow
4	S	Slow
5	QS	Quite slow
6	AS	A bit slow
7	MD	Medium
8	AF	A bit fast
9	QF	Quite fast
10	F	Fast
11	VF	Very fast
12	VVF	Very very fast
13	EF	Extremely fast
14	EVF	Extremely very fast

Figure 3

Tool Type	1st input		2nd input		Output	
	Material hardness		Depth of cut		Cutting speed	
	Min	Max	Min	Max	Min	Max
High-speed steel	85	275	0	16	16	59
Uncoated brazed carbide	85	275	0	16	60	172
Uncoated index able carbide	85	275	0	16	63	225
Coated carbide	85	275	0	16	105	336

Figure 4

Material Hardness	Depth of cut				
	VS	S	MD	D	VD
VS	EVF	MD	AS	QS	VS
S	F	QS	S	VS	VVS
MD	F	S	S	VVS	VVS
H	QF	S	VS	VVS	ES
VH	MD	ES	ES	ES	EVS

Figure 5

Material Hardness	Depth of cut				
	VS	S	MD	D	VD
VS	EVF	MD	AS	QS	VVS
S	F	QS	S	VS	VVS
MD	F	S	S	VVS	ES
H	QF	S	VS	VVS	ES
VH	AF	S	VS	VVS	EVS

Figure 6

Material Hardness	Depth of cut				
	VS	S	MD	D	VD
VS	EVF	QS	QS	S	VS
S	VVF	S	S	VS	VVS
MD	F	QS	S	VVS	ES
H	AF	S	VS	VVS	EVS
VH	AF	ES	ES	ES	EVS

Figure 7

Material Hardness	Depth of cut				
	VS	S	MD	D	VD
VS	EVF	MD	AS	QS	S
S	VF	QS	S	VS	VVS
MD	F	S	S	VVS	VVS
H	QF	S	VS	VVS	EVS
VH	MD	VS	ES	ES	EVS

Figure 8

Input			Output		
Fuzzy expression (abbreviation)	Universe of fuzzy membership	Depth of cut (mm)	Fuzzy expression (abbreviation)	Universe of fuzzy membership	Feed rate (mm/r)
VS	0	0	VS	0	140
	1	1.5		1	180
	0	2.5		0	220
S	0	1.5	S	0	200
	1	3.5		1	360
	0	5.5		0	520
M	0	2.5	MD	0	220
	1	8.25		1	465
	0	14		0	710
D	0	5.5	F	0	520
	1	10.5		1	640
	0	16		0	720
VD	0	14	VF	0	710
	1	16		1	750
	0	18		0	790

Figure 9

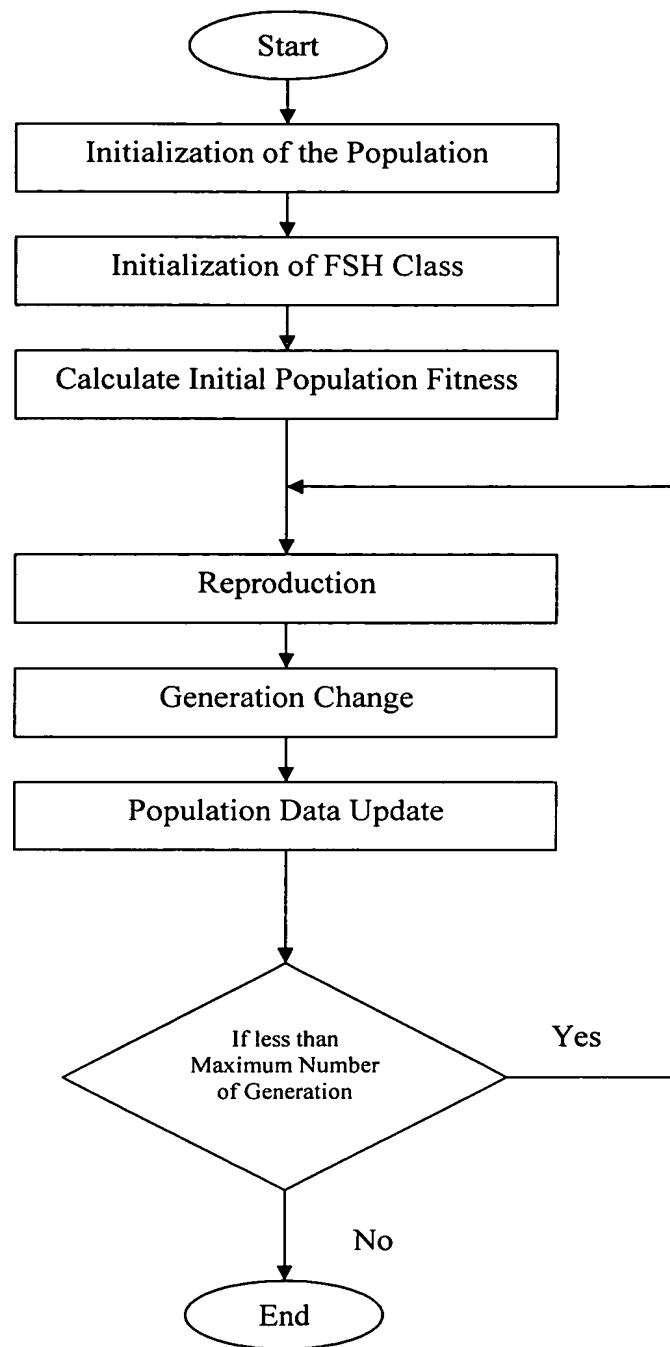


Figure 10

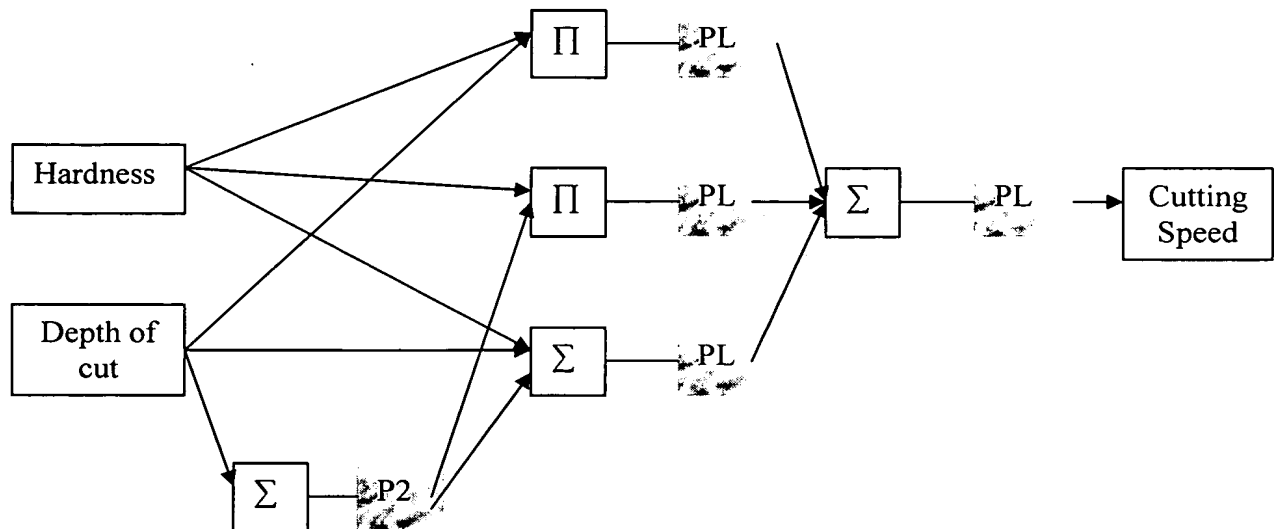


Figure 11